SCIENCE

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY N. D. C. HODGES, 874 BROADWAY, NEW YORK.

TENTH YEAR. VOL. XIX. No. 470. | FEBRUARY 5, 1892. | SINGLE COPIES, TEN CENTS. $3.50 PER YEAR, IN ADVANCE.

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Entered at the Post-Office of New York, N.Y., as Second-Class Mail Matter.

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

First inserted June 19. No response to date.

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874 BROADWAY, NEW YORK.

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NEW YORK, FEBRUARY 5, 1892.

A LUMP OF SALT AND A GLASS OF WATER.[1]

WITH ordinary use the powers of eye, ear, smell and touch fail to distinguish between the glass of pure water, and that to which salt has been added. The taste alone gives immediate evidence of the difference. But let us examine more closely, and, first, by chemical tests. Solution of silver nitrate, added to the brine, gives a white, curdy precipitate containing chlorine, a platinum wire would take up enough to impart a yellow color to the Bunsen flame, indicating sodium. Thus two constituents may be separately recognized in the solution by the appropriate tests, where only common salt was added. So, in general, if we wish to detect a salt in solution, we depend upon properties belonging to the basic radical and those belonging to the acid radical; the appropriate tests being separately applied. Such properties are called "additive," since they express the sum of the properties of the constituents. The special use of this term may be clearer on reviewing some electrical properties.

Two kinds of solutions are distinguished by means of the electric current. Absolutely pure water seems to be a non-conductor, while the addition of a salt, acid, or base enables the current to flow, the added body being separated into two parts called ions, which appear at the two electrodes. Such bodies are called electrolytes; and the quantity of electricity passing through the fluid is directly proportional to the quantity of electrolyte decomposed. Many organic bodies are not thus decomposed, their solutions being non-conductors. While the molecule of common salt is believed to contain but two atoms, and sugar contains at least forty-five, yet the former may be separated by the electrical influence in a manner from which the latter is free. The forty-five atoms of the sugar molecule dwell together as a unit, while the two atoms of common salt may part company and enter into new relations, thus presenting a scene of activity and complexity which we should hardly expect from its apparent simplicity.

Let a current pass through a solution of copper sulphate, entering through a copper plate, and passing out at any properly coated form; the copper is carried through the solution with the current, and is deposited as an electro plate coating; while the negative radical slips back to attack the kathode. The quantity of basic and acid radicals thus transferred, under given conditions, depends upon the conductivity of the solution; but to compare solutions of different kinds we should make the concentration proportional to the chemical equivalents. In this way Ostwald has measured the molecular electrical conductivity of many solutions of varying degrees of concentration. The following are a few of his results to the nearest unit for extremely dilute solutions — $\frac{1}{1024}$ normal. The differences are shown in small, bold-face type.

$LiCl$,	119	9	$NaCl$,	110	23	KCl,	142
	5			5			6
$LiNO_3$,	105	9	$NaNO_3$,	114	22	KNO_3,	136
	3			7			6
$LiClO_3$,	97	10	$NaClO_3$,	107	23	$KClO_3$,	130

[1] Abstract of the annual address before the Washington Chemical Society, delivered Jan. 28, 1892, by Rabt. B. Warder.

The numbers obtained for lithium salts are about 9 less than for the corresponding sodium salts, and these about 23 less than for the potassium salts. Comparing the horizontal lines we find the numbers for chlorides about 5 higher than for nitrates, and these about 7 higher than for chlorates.

To appreciate the full meaning of these differences in the numbers we may again refer to the tests of qualitative analysis. A salt has no single property by which it is recognized, but we depend upon the several properties of basic and acid radicals, which are largely independent of each other. The molecular electrical conductivity is here expressed merely by a number; but do not be repelled by a sense of vagueness. This number expresses motion, — the greater the number the more activity displayed in transfer of electricity. The lithium atom is less active in this way than sodium; and this is true, whatever be the company in which the metal is found. The activity of chlorine is greater than that of the nitric radical, and this greater than the chlorine radical; but the activity of the salt must be viewed as the sum of this property for the components. Each number is clearly the sum of two numbers, one belonging to the basic, the other to the acid, radical. On no other hypothesis can we explain the fact that when we select two basic or two acid radicals the substitution of one radical for the other always results in the same change of the number, no matter what third radical may be combined with these two. In a word, the molecular electrical conductivity is an additive property of salt solutions.

If we leave water and brine in the cold both will freeze; but the brine must be cooled to a lower temperature before freezing begins. The differences between freezing point for solutions and the solvent have been made the subject of many extended researches with special forms of thermometer. Readings are estimated to .01°. The result has been a flood of light upon the molecular weights of substances in liquid form, together with some remarkable differences between salt and sugar, between brine and syrup, or between the two classes of solutions which these represent.

Take three similar barometers, introduce a drop of water into the Torricellian vacuum of the first, and the mercury falls; the water is partly changed to vapor, which exerts a certain pressure on the mercury, and this vapor pressure may be measured by the difference in level. Now put a drop of brine into the second barometer, the mercury falls here also, but to a less extent. The vapor pressure of the brine is less than that of pure water. The process of evaporation or condensation in a current of air affords another means of determining the relative vapor pressure of various solutions. If we now boil water and brine in separate vessels the pressure of vapor equals that of the atmosphere; but, when this point is reached, the brine is hotter than the water, — the boiling point of the former is higher. Thus we have a third method of comparing vapor pressures. This property of solutions, in its quantitative aspect, rivals the freezing point as an avenue to the secrets belonging to our subject, which are yet only partly disclosed. As solution proceeds the denser brine gradually mixes with the water above, until at last the whole fluid would be practically uniform. Various salts will diffuse at different rates. A porous membrane will transmit

the molecules of water more readily than those of a salt. For certain theoretical investigations we may conceive a "half permeable" wall with openings so small that the water alone can penetrate. As a filter separates a solution from the insoluble residue, so the half-permeable wall is to transmit the solvent, while preventing the passage of the dissolved salt. No material has been found fully possessing this ideal property; but theoretical deductions have already been confirmed by experiments with clay cells, the pores being partly closed with a film of insoluble precipitate. If a solution fills such a cell, while fresh water surrounds it, the contents soon show a considerable pressure, which is measured by a manometer. This phenomenon is called "osmotic pressure," and we may have several conceptions of its cause. Either there is an attraction between the unlike molecules in the brine and the fresh water, so that the latter flock in where the salt is imprisoned (as ducks fly to the decoy) until the internal pressure arrests the flow; or the osmotic pressure may be due to the aggregate force of impact of the many moving molecules; this is the view generally taken.

The several properties that have just been considered require numerical expression, but these numbers are wonderfully related to each other and to the doctrine of the conservation of energy. For example, consider the relation of osmotic pressure to vapor pressure. Let a cell with half-permeable wall, connected with a vertical tube be filled with solution, and immersed in a tank of pure water; the whole arrangement being placed under a bell jar in vacuum. Under osmotic pressure the solvent will enter the cell until a certain pressure is reached, as determined by the height of the liquid in the vertical tube. Evaporation will take place at the same time, both from the surface of the solution in the tube and from the solvent in the tank, at their respective levels, until the jar is filled with vapor. A condition of equilibrium will eventually be reached, for otherwise we should have perpetual motion. On the half-permeable walls of the porous cell we have an inward and an outward pressure, whose difference is measured by the height and density of the solution in the vertical tube. On the surface of the two fluids we have a vapor pressure, the difference being measured by the same height and the density of the vapor in the bell jar. The former value is the osmotic pressure, the latter is the diminution of vapor tension caused by adding the solid to the solvent; and these two values stand exactly in the ratio of the densities of solution and vapor. By other thermo dynamical considerations a relation is traced between osmotic pressure and the change in freezing point, electrical conductivity, etc.

Important analogies between the physical properties of gasses and those of dissolved bodies are pointed out by van't Hoff; the laws of Boyle, Gay-Lussac, and Avogadro all have their counterparts in the phenomena of osmotic pressure.

First. Boyle's law says that the pressure of a gas is inversely proportional to its volume: that is, that as the quantity of any gas in a given volume is increased or diminished the pressure changes in the same ratio; so, the osmotic pressure of many solutions is found to vary directly as the concentration.

Second. Gay-Lussac's law may be expressed by stating that the gaseous pressure varies directly as the absolute temperature; the same is true of osmotic pressure.

Third. Avogadro's law implies that two gases, at the same temperature, will have equal pressures when the masses of equal volumes are proportional to the molecular weights. The same is true for osmotic pressures in equivalent solutions of different comparable substances. To calculate the osmotic pressure conceive the solvent to be absent, while the solid occupies the same space as gas; the hypothetical gaseous pressure, as determined by the three fundamental laws, is then equal to the osmotic pressure required. Conversely, to determine the molecular weight of a dissolved body, we may find the osmotic pressure and calculate as for a gas; practically, the depression of freezing point is the physical property usually measured.

In a word, the three fundamental laws of gaseous matter are found to be true of dissolved matter simply by substituting osmotic pressure for gaseous pressure, while even the anomalies and limitations so long recognized in gases and vapors find their counterparts in solutions. Can we find identity of cause when there is almost identity of result? In a gas matter is in a far more dilute condition than in ordinary solids or liquids; the intermolecular spaces are evidently far greater than the space occupied by the molecules themselves. The same is true in a dilute solution of salt, only here the intermolecular space is largely occupied by the water. In both cases, motion is indicated by the phenomena of diffusion. In both cases, each moving molecule is endowed with kinetic energy, and the sum of the vis viva of all the molecules exactly accounts for the laws of pressure. The formulas used to unfold the kinetic theory of gases may be applied without change to a kinetic theory of solutions. In a jar of hydrogen, the molecule darts hither and thither at the rate of a mile a second, asking for no support save other molecules, from which it rebounds. If hydrogen mixes with the denser vapors of paraffin, it will still exert its own pressure upon the walls of the vessel, as though it were alone. Our salt is less ethereal. The molecules are heavier. They move more sluggishly. Very slowly do they rise, as though climbing with painful effort upon an unsteady ladder of water molecules. Yet, with the aid of the half-permeable wall, their pressure is found to be just what it should be on the kinetic theory, if the salt alone occupied the space in absence of water.

Anomalies and limitations have always been mentioned. There is no "perfect" gas, none that exactly fulfils the fundamental laws, but hydrogen, which most nearly agrees with the "ideal gas" in its properties, is not compressed to one-tenth its volume by ten-fold pressure, but occupies a little more than one-tenth volume. Here, the molecules themselves may be considered as incompressible bodies occupying too great a fraction of the whole space to be left entirely out of account. A modification of Bowle's law assumes that the total intermolecular space varies inversely as the pressure. In most gases and vapors, however, the deviation is in the opposite direction. As the molecules approach each other their mutual attraction is manifested, for the volume becomes less than required by Boyle's law. The piston of a Corliss engine, which glides so beautifully to and fro, in obedience to valve and governor, is impelled by the bombardment from an army of vapor molecules, each one following its own impulse almost untrammelled in the go-as-you-please contest; yet some mutual attraction is manifest, for the steam exerts a little less pressure upon the piston than would an ideal gas under like conditions. So, osmotic pressure, instead of increasing directly as the concentration, may increase a little less rapidly. There is a well-known body whose vapor density has long been recognized as abnormal.

Ammonium chloride, when converted into vapor, is found

to occupy twice the volume predicted by theory, — in other words a given volume of the vapor exerts twice the theoretical pressure. The explanation is easy when we learn that the salt is dissociated into the two gases, ammonia and hydrochlorine acid. Similar anomalies in osmotic pressure may lead to a similar interpretation, although quite antagonistic to our ordinary conceptions and teachings. Sodium will burn in chlorine with striking evolutions of light and heat; we recognize the product as a new substance. Chemical action has taken place. By a large expenditure of energy the elements may again be separated; this also is chemical action. But we dissolve the salt in water, evaporate, recover it as before, and are prone to count all these changes as purely physical. Little do we suspect that the dilute solution contains in free state the two substances which we usually know as metal and gas, the two kinds of atoms moving independently of each other, so long as they are distributed in equal numbers in any portion of the fluid. Yet such is the theory of Arrhenius, now fast gaining ground. Cold water decomposes a most stable compound, the elements being gradually reunited in evaporation and crystallization. Accept this hypothesis for electrolytes and their peculiar properties are explained, their additive character must follow as a necessary consequence of their nature, and the several kinds of anomalies fall into harmonious relations.

On this hypothesis the speed of chemical change should no longer be proportioned to the whole quantity of each active substance present, but rather in proportion to that part which has already suffered loosening of the bonds. The facts of dynamical chemistry afford an independent and valuable confirmation of the new views.

THE ORIGIN OF THE ASS, THE CAT, AND THE SHEEP IN CHINA.[1]

AT a recent meeting of the China Branch of the Royal Asiatic Society in Shanghai, Dr. Macgowan, a well-known Chinese scholar, read a paper on the probable foreign origin of the ass, the cat, and the sheep in China. He said that the Chinese, in their numerical co-ordination of concrete and abstract nature, give the "six domestic animals" as the horse, ox, goat, pig, dog, and fowl; which seems to indicate that when that formula was framed, neither cat, sheep, nor ass had been domesticated there. When familiar beasts were selected to denote years of the duodenary cycle, to the "six domestic animals" were added the rat, tiger, hare, dragon, serpent, and monkey, to complete the dozen, as if the ass, sheep, and cat were too little known to meet the object in view, which was the employment of the most familiar representations of animated nature for the duodendary nomenclature. Still more striking is the absence of the ass, sheep, and cat from the twenty-eight zodiacal constellations, which are represented by the best-known animals.

With regard to the ass, there is ample reason to regard it as being excluded from the list of domestic animals because it was not archaic. The hybrid mule is of comparatively modern origin in China, dating back only about a score of centuries. A miscellany of the Sung era states that "the mule was not seen during the Hsai, Shang, and Chou dynasties; that it was a cross between the ass and horse from Mongolia. It is regularly bred in the north, and is worth in the market twice as much as the horse; it is popularly reported that its bones are marrowless, which is the reason of its inability to produce its kind." Again, it is recorded in a Ming cyclopædia: "The mule is stronger than the horse, and is not a natural product of China; in the Han era it was regarded as a remarkable domestic animal." Is it likely that, if the ass existed during the three ancient dynasties, there was no crossing with the horse?

With regard to the cat, Dr. Macgowan proceeded to state that there was a quotation from a standard work which discloses the fact that Yuang Chuang, the pilgrim monk, who, in the seventh century A.D., returned after sixteen years' wanderings in India, brought cats with him to protect his collection of Sanscrit Buddhist books from rats. That account, however, is somewhat invalidated by an anecdote of Confucius, who is related to have one day seen a cat chasing a rat. These conflicting statements are from authoritative sources, and it is impossible to offer a satisfactory explanation. Possibly the cat of Confusian times was only a partially domesticated wild cat. There must have been some ground for the statement of the cat having been brought from India, as it is hardly likely that in all the long period of Chinese history it should be named but twice as a domestic animal. He quotes from Chinese folk-lore on the subject of cats. As cruelty to cats and other animals is followed by retribution, so services rendered to them meet with supernal recognition. As anciently the tiger was sacrificed to because it destroyed wild boars, so the wild cat was worshipped because it was the natural foe of rats; boars and rats being the natural enemies of husbandry. At the commencement of the Sui dynasty, A.D. 581, the cat spirit inspired greater terror than the fox did subsequently. The hallucinations of cat spirit mania prevailed, forming a remarkable episode in Chinese history, only to be likened to the fanatical delusion of witchcraft that frenzied Europe a thousand years later. It was believed that the spirit of a cat possessed the power of conjuring away property from one person to another, and inflicted through incantations bodily harm. The popular belief was intensified and spread like an epidemic, until every disastrous affair that took place was ascribed to cat spirit agency set in motion by some mischievous enemy. Accusations were lodged against suspected persons, and, the slightest evidence sufficing for conviction, the malicious were encouraged to trump up charges against the innocent, until the country became a pandemonium. No one was safe, from the Imperial family down to the humble clodhopper. Even a magnate of the reigning house, who enjoyed the titular distinction of Prince or King of Szechuan, was executed for nefariously employing the agency of cat spirits. In this manner several thousands were immolated before the delusion was dispelled. Happily the period appears to have been of brief duration: incentives such as kept up the witch mania for centuries were wanting in China. Coming down to our own times we find a cat-craft delusion prevailed over a great portion of Chêkiang. "In the summer and autumn of 1847 frightful wraiths appeared throughout the departments of Hangchow, Shaohsing, Ningpo, and Taichow. They were demons and three-legged cats. On the approach of night a fœtid odor was perceptible in the air, when dwellings were entered by something by which people were bewitched, causing alarm everywhere. On detecting the effluvium in the air, householders commenced gong-beating, and the sprites, frightened by the sonorous noise, quickly retreated. This lasted for several months, when the weird phenomena ceased." Well did he remember, said Dr. Macgowan, the commotion that prevailed in Ningpo throughout those months of terror. Every gong that could be procured or manufactured for the occasion was subject to vigorous thumping

[1] From Nature.

through the livelong night, maintained with vociferations by relays of zealous beaters. This deafening din was but a recrudescence of what had occurred a few generations before — a panic which was only exceeded by that which subsequently prevailed over the entire empire.

With regard to sheep, Dr. Macgowan said the ancient mode of writing the character for *yang*, goat, was ideographic — four strokes on the top to represent horns, two horizontal strokes representing legs, and a perpendicular one to represent body and tail. The modern form gives an additional parallel stroke, like the word for horse; it is a simple, not a compound character, and when sheep came to be known, instead of making a new character, the sheep was called the "Hun-goat," thus indicating its origin and affinity. *Yang*, goat, is often translated sheep, the earliest instances being found in one of the Odes, wherein the court habiliments of Wen Wang are called "lamb-skins and sheep-skins." This was about 1160 B.C., but it is doubtful if these robes are really the skins of sheep. It is not certain that such was the case, for the skins of goats were used then, as now, for clothes. Hun-goats are not named before the period of the Tang dynasty, say the seventh century A.D. The goat was one of the sacrificial animals, as at present, and was at the first selected for sacrifice when sheep were unknown.

In the discussion which followed, the conclusions of the paper were not accepted by all the speakers; and it was agreed that the subject was one worthy of scholarly investigation.

NOTES AND NEWS.

The International Statistical Congress, which met at Vienna in October last, selected the city of Chicago and the summer of 1893 as the place and date of their next meeting, and a committee was appointed to draw up a report on the question of emigration, which is to be discussed at that time.

— It is said that two pieces of aluminium can be soldered together with ease by using silver chloride as a fuse. The pieces of metal are placed together in their proper relative positions, and finely powdered fused silver chloride spread along the line of junction, after which the solder is melted on with a blow-pipe.

— Professor E. A. Fuertes, director of the New York State Weather Bureau, Ithaca, offers to send telegraphic notice of cold waves to such persons in New York State as will display the regulation signals for the benefit of the public. This bureau works in co-operation with the Washington office. A limited number of flags will be furnished by the Ithaca office, and those applicants who cannot be thus supplied will be given a list of dealers from whom the flags may be obtained. The flags, which are of bunting material, may also be made by the persons using them.

— A mine of coal of very fair quality for steaming purposes has been found by accident in the Straits of Magellan, according to *Engineering*. Signor Fossetti, the captain of an Italian steamer, was compelled to anchor in Shagnet Bay to make some repairs, and while there he discovered coal very near the surface. Reaching Valparaiso, he sent a corps of experts to the scene of the discovery in a steam launch, who found that the coal was not only abundant but of excellent quality. The importance of the discovery to the commerce of the world can only be appreciated when it is considered that all steamers passing through the Straits of Magellan are required to coal there, and that the supply has heretofore been brought from Cardiff, Wales.

— According to observations made at recent meetings of the Berlin Medical Society, it would seem that the epidemic of influenza began there during the first week of November, the earliest cases admitted into hospital having come under treatment on Nov. 7. Ruhemann stated that the most noticeable difference between this and the other recent epidemics has been the large number of women and children, and the small number of outdoor workers attacked. Guttmann mentioned an instance in which the admission of a single patient suffering from influenza was shortly followed by the occurrence of 13 fresh cases. Fränkel, who took notes of 188 cases, found that only 9 (6.5 per cent) had suffered from the disease before. The chief complications have been pneumonia and heart failure. The effect on the death-rate in Berlin has not been so marked as during the last epidemic, but it has been considerable (27 per mille as compared with an average of 18). In other parts of Germany the effect has been more marked; thus official statistics show that the death-rate has been doubled, or nearly doubled, in several towns. It rose, for instance, to 44 in Posen (average 21), to 45.6 in Frankfort on-Oder (average 23.3), in Bremen to 34.3 (average 17.1), and in Rostock to 33.5 (average 15.6).

— The citizens of New York, in 1892, propose to celebrate the discovery of America in their own way, assisted by representatives from every State and territory in the Union. A great food show is to be held at Madison Square Garden in October of that year. It is proposed at this exposition to show the progress made by this country in the last four hundred years as regards our food supply. The United States is the greatest food-producing country in the world, and as food is the one thing above all others that first claims the attention of the human family, it is safe to predict that the coming exposition will prove one of the most interesting events of the century. Only food products will be allowed on exhibition, exhibitors being restricted to manufacturers or producers, no dealer as such being allowed to participate. Every article of food exhibited must bear the bona fide name and address of manufacturers, all fictitious brands being rigidly excluded. Liquors, specifics, and patent medicines will not be allowed. Every manufacturer exhibiting must guarantee that his goods at the exposition are the same as offered for sale to the public. Further information may be obtained of the Food Manufacturers' Association, Hudson and Harrison Street, New York City.

— The United States consul at Bordeaux gives, in a recent report, some interesting information about the wines of the Medoc district. He notes that this district, between the sea on the one hand and the Garonne and Gironde Rivers on the others, is called Medoc (*quasi medio aquæ*), because nearly surrounded by water. It is the northern termination of the extensive tract of sand hills and marsh-land called "Les Landes," extending from Bayonne north, which changes to a bank of gravel on approaching the left bank of the Garonne, and contains some of the most precious vineyards in the world. The soil is of light pebble, and, indeed, on the spots where some of the best wine is produced it appears a mere heap of quartz mixed with the most sterile quality of earth. The best wine is not produced where the bush is most luxuriant, but on the thinner soils, where it is actually stunted, and where weeds disdain often to grow. Here the vine retains the sun's heat about its roots after sunset, so that its juices are matured as much by night as by day. The accumulation of sand and pebbles of which this soil is composed is apparently the spoils of the Pyrenean rocks, brought down by the torrents tributary to the Garonne and other great rivers, and deposited in former ages on the borders of the sea. At a depth of two or three feet from the surface occurs a bed of indurated conglomerate, which requires to be broken up before the vine will grow.

— *Nature*, Jan. 21, contains some extracts from a valuable report by the French agent at Victoria on the salmon industry in British Columbia. Among the details noted by him is the fact that the best fish are almost always taken on the outflow of the river in the place where the fishermen endeavor to meet the fish on their arrival from the sea. A boat is often filled with several hundred fish in a single drift net of from 400 to 500 metres. It is calculated that on certain days the total of the Fraser fishery amounts to not less than 150,000 salmon, which are passed through all the different phases of preserving, and are ready to be forwarded for the market on the same day. An ingenious apparatus used to take the salmon, chiefly on the Columbia River in

the United States, is described. A large wheel, fixed at a certain distance from the bank, is put in motion by the current. The blades of this wheel are provided with a network of iron wire intended to raise from the water any large object coming in contact with them. A sort of bar-work starting from the wheel is so placed as to increase the strength of the current in such a manner as to force the fish passing on this side of the river to go in this direction. The salmon, wishing to cross the very rapid stream where the wheel is placed, is raised out of the water by the iron wire on the blades. In the rotary movement the salmon is carried to the centre of the wheel, whence an inclined plane conducts it into vast open reservoirs placed in the stream, where it can be kept alive for some time. A system of pulleys provides for the raising of these reservoirs, the water flows out, and the salmon is carried in boat-loads just as it is required for preparation.

— A new instrument, called the "schiscophone," lately invented by Captain de Place (a French officer), is described in *Engineering*. The object of the instrument is to reveal the presence and the place of any blow-holes, flaws, cracks, or other defects which may exist in the interior of a piece of metal. When these defects are very great, the blow of a hammer on the piece of metal soon betrays their presence, but for small blow-holes, although these may also be very dangerous, there is not enough difference in the sound given by the hammer striking the piece of metal for it to be detected by the ear. The schiscophone, however, will enable that difference to be heard. The apparatus consists of a pin which runs through a microphone of a special construction, which, as usual, is put in connection with the current of an electric battery. Without giving more details of the complicated mechanism of the instrument, one can understand that, when the pin strikes on a good part of the metal tried, a sound is produced, the vibrations of which affect the electric current in a certain way and then a certain sound can be heard in the telephone attached to the instrument. When the pin strikes on a part of the metal where there is a defect, the sound produced is different; the microphone, the current, and the telephone are then affected differently, and the defect existing in the metal is revealed by the difference in the sound heard at the telephone. The ear must, of course, be used to the different sounds to be able to distinguish them; but the necessary skill is not very difficult to acquire. Trials with this instrument have been carried out at Ermont, at the works of the Northern Railway Company of France, in the presence of many engineers, to find defects in the rails. The telephone of the apparatus was placed at a long distance from the rails, from which it was also separated by a wall. The points where the instrument intimated a defect in the metal were carefully noted; the rails were then broken at those places and the defects were actually found.

— The great Australian expedition has succeeded in traversing, from north to south, the first or most southerly of the three great blanks it was commissioned to explore. This is the wide interior space lying between the track of Forrest in 1874 and that of Giles in 1875. The party crossed the boundary between South and West Australia, at a point to the east of Fort Müller, in latitude 28° 10′ south and longitude 128° east, and struck south across the desert from Mount Squires, making for Queen Victoria Spring, on Giles's track of 1875. Arriving at that expected abundant water-supply, they found it nearly dry, and all hopes of a thorough exploration of the region were destroyed. Under these circumstances, and sorely straitened for water, a direct route was taken for the nearest cattle stations, near the southern seaboard of West Australia and Esperance Bay, from which latter port Mr. David Lindsay, the leader, despatched reports of the expedition to Adelaide in October last. The country traversed appeared to have had no rain for two years. Owing to admirable management on the trying march of 500 miles through an almost waterless country, the health of the party had not suffered, and only two of the camels had died. Notwithstanding the utter aridity of the region, Mr. Lindsay remarks that it cannot be called a desert, for the country is more or less clothed with bushes and trees, and for many miles there is a gum-tree forest which extends into South Australia, the trees reaching often three feet in diameter and forty to fifty feet in height. He adds that the clean white trunks and dark-green tops of the trees from a short distance present a charming aspect, but that a nearer examination reveals the usual signs of aridity, the ground being covered with nothing but the desert-loving spinifex and useless shrubs. Mr. E. A. Wells, the surveyor of the expedition, reports that the whole of the country travelled over from Mount Squires was inhabited by natives who got their water-supply partly by draining the roots of certain mallee trees, some of which, distinguishable only by the keen observation of a native, yield quantities of pure water. It was Mr. Lindsay's intention to remain near the south coast for some weeks to restore the strength of the sorely-tried camels, and then to proceed again towards the interior, taking a more westerly route, so as to cross Giles' route at Ularing, and Forrest's track at Mount Ida, and thence on to Hope's Station *viâ* the new gold fields. From the last-mentioned place he had hopes of making an excursion south-east as far as latitude 28°, and thus completing sufficiently the examination of the first great area it is the object of the expedition to explore, before proceeding to the second, further north.

— A magnificent diamond, a perfect octahedron, weighing 208 karats, has been purchased from a river digger by a Kimberley buyer, says the *South African Mining Journal*. It is the second largest stone ever found in the Vaal diggings, the largest being the celebrated Spalding diamond of 380 karats, but which was yellow and of bad shape. The price paid for the stone recently found is said to have been £2,000; since his return from the river the buyer has been offered £3,000 for it, which offer has been refused.

— The *Engineering and Mining Journal* of Jan. 30 gives an abstract of a paper by N. Lebedieff on a direct process for producing iron and other metals from their ores. According to this method the metallic oxides are brought in contact with a strong base (potash, soda, lime, or dolomite) by either melting the two in a finely divided state or by roasting such mixture in furnaces provided with a powerful air blast, stirring the mass frequently. To hasten the process common salt or nitre may be added to the roasted mixture. Some combinations of metallic oxides with alkalies may be produced by the wet process; for example, alkaline aluminates. Abstracting the pure metals may then proceed in cupolas, open hearths, or in crucibles in reverberatory furnaces. To the mixtures prepared as above are added charcoal, coke, etc., as well as a proper amount of silicious materials to produce slag upon the reduction of the metals. In order that furnace walls be not attacked the inner lining is best made of neutral material. In the reduction of iron and other metals easily separated by coal, etc., gas, under proper pressure, containing a sufficient amount of CO, H, or C_nH_n may be used instead of coal, etc. Smelting is then carried on in open hearth or reverberatory furnaces. The reducing gases are brought into the molten mass by pipes discharging at a proper height, or by tuyères issuing from chambers in the furnace walls, and connected with pressure generators or gasometers. After properly heating the furnace the carefully mixed oxides and bases, or the oxides previously treated with bases, are introduced and heated until thoroughly melted, when the reducing gases are allowed to penetrate the mass. In proportion to the relative reduction of the metal and separation of the bases a further thin layer of oxides is added. These latter combine readily with the free base and melt, and the gas then again reduces the metal, the base is again separated and thus the process continues. In case the oxides combine readily with the bases by simple smelting the operations can all be carried on in one furnace. Metals melting easily are tapped from time to time as they are produced. Metals which are refractory, such as iron, chromium, etc., can be dosed with materials which lower their melting point (high carbon pig in the case of iron), or else they are treated, after a sufficient quantity has been produced and removed from the furnace, with water or acids after cooling, thereby dissolving the alkaline salts, the insoluble metal remaining undisturbed in the shape of small plates.

— Dr. Charles S. Edwards, fellow in Clark University, Worcester, Mass., has been appointed assistant professor of biology in the University of Texas.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

874 Broadway, New York.

Subscriptions.—United States and Canada.....$3.00 a year.
Great Britain and Europe..... 4.50 a year.

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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INDIAN OCCUPATION OF NEW YORK.

We have not learned all that will some day be known of the aboriginal occupation of New York, but occasional contributions or systematic statements have a present value. We are thankful for much that has been written, and only wish that more had been done before so many works were obliterated and relics destroyed.

It is quite likely that erroneous estimates have been made in regard to some remains, for fewer occupied spots have been overlooked or forgotten than would be supposed. I have consulted all accessible authorities, certainly the most important, and find less than one hundred and ninety defensive earthworks described or even mentioned, while of stockades which have left traces there are between twenty and thirty. We know that more of the latter were in use, from history; but there are special reasons why the traces of these were fewer than of earthworks. A liberal allowance for undescribed or indefinitely mentioned defensive banks might bring this class of fortifications up to two hundred and fifty, which is probably a fair allowance for the State of New York. It is to be remembered, however, that some have been reported where none existed, and that others have been confused. It is not my purpose now to point these out. With a considerable outlay of field and home work during many years, I have collected notes and collated accounts, so that I have on the map before me a pretty fair view of the field of Indian occupation in New York. In the central part of the State very few sites have escaped my attention, even when small, and this long continued study presents some curious results.

My present intention, however, is merely to show the grouping and nature of the more important known works, although by far the finest articles of stone have come from open villages, hamlets, and camps occupied by early travellers, fishermen, or hunters. The fort builders here had in a measure left the stone age behind them, and stone gouges, gorgets, amulets, and kindred articles, are to be looked for where camps or unenclosed villages stood. The fort builders preferred working in clay, bone, and horn, using no flint scrapers or drills, and even making stone arrows somewhat sparingly.

When known sites are placed on the map, especially when unimportant ones are eliminated, it will be found that there is a very distinct arrangement in groups, nor does the presence of even small camps change this materially. Hunters, of course, camped on most large streams and lakes, but the rivers had the larger number. Defensive works are oftener at some distance from navigable waters, though having a tendency to the sides of broad valleys. It will be found that some counties present scarcely a trace of settled occupation, while others have them in abundance.

One large group lies in the south-west part of the State, where Cattaraugus County has eleven defensive earthworks mentioned, with others undescribed, and also at least ten burial mounds. Chautauqua has even more abundant remains of this group, having forty-four earthworks and fifteen burial mounds of various kinds. There have been reported also seven ossuaries or bone pits, similar to those found in the Huron country, in Canada. A very few of these defensive works seem to belong to the historic period, containing European relics. With all the descriptions we have of these works, it is a pity that no systematic, and hardly general, report has been made of the articles found, such as has thrown so much light on works further east. In general, the indications seem Iroquoian, though presenting some features of a border land. It is doubtful whether all the works there are of a northern character.

Forming another group, slightly connected with this, Erie County has seventeen earthworks, seven mounds, and four ossuaries. Others have been obliterated before description, but probably not many have escaped mention. The forts are mostly smaller than in the last group. Niagara has three earthworks, six mounds, and four ossuaries. In a general way, the seven earthworks and three mounds of Genesee County may be placed in the same group, and Orleans lies on the border with one earthwork, one ossuary, and traces of works now obliterated. In this group are found many quite recent villages, especially of the Iroquois. Most of the remains, however, are prehistoric, the Eries and Neutrals barely coming in contact with the whites.

In the territory further east, acquired by the Senecas in the seventeenth century, recent villages predominate, but the broad valley of the Genesee has many prehistoric sites, mainly grouped towards the mouth of the river. Monroe County seems to afford twelve earthworks, one recent stockade, and twelve mounds; Livingston County, eight earthworks, one stockade, and twelve mounds, some of these being recent. Wyoming County has one small earthwork and one mound. Ontario County has two earthworks and three stockades, part of both these being recent, as are most of the village sites and burial places. Yates has two earthworks described and some indefinitely reported. One other, planned and described, is evidently erroneous. Tompkins has four earthworks, one in combination with a stockade, and all prehistoric. Allegany has three earthworks and some recent Seneca villages.

Between this and the Cayuga group there is a less distinct line. Seneca County belongs to this, but has but two earthworks described, though reference is made to others by DeWitt Clinton. Wayne has one very small work, in good preservation. Cayuga has five earthworks, part of them recent, and three early stockades. It abounds in recent vil-

lages, whose stockades, if there were such, have left no traces. Strictly, a part of the earthworks in the western part of Onondaga County belong to this, though forming a small group by themselves. For present purposes it is easier to class them with the next.

The Onondaga group, which I have long studied in all its parts, is of high interest. The Elbridge earthworks, to which I have alluded, are all prehistoric, and are allied to another small group towards the Oswego River. These are circular, and between them occurs a small group of circular stockades, near the Seneca River. All are of Iroquoian character, yet very different from the forts of the Onondagas, who settled in the south-east part of the county three hundred years ago. This county affords seven earthworks, eight stockades, and two burial mounds. The earthworks and stockades are both early and recent, the later stockades being generally angular. Part of Madison County belongs to this group, and in this is found the earliest fort of the true Onondagas, occupied about A.D. 1600. Oswego County forms part of the same group, but has few villages. Three earthworks and one mound occurred near the Oswego River.

The Oneidas occupied Madison more than Oneida County, and in the former have been reported one earthwork and five stockades. Some historic forts may have left no traces. There are many recent villages, but few early. Oneida County affords few remains, though there are some early hamlets north of the Mohawk and west of Utica.

The Mohawk group is mainly in Montgomery county, with one large village in Fulton, of about A.D. 1600, one of the two earliest Mohawk towns. In Montgomery there are some early camps and one earthwork. All the villages except the last mentioned are recent, but the traces of their stockades are lost. The earthwork seems barely prehistoric.

The Jefferson County group is strictly prehistoric, and may be compared with the Chautauqua. It seems to have been the early home of the Onondagas, the Mohawks coming from lower down the St. Lawrence. There are thirty-three earthworks, two burial mounds, and six ossuaries, besides obliterated sites. The mounds reported at Perch Lake are foundations of circular lodges.

A smaller group is in St. Lawrence County, where there are eight earthworks, and possibly related to these are a few nearly opposite in Canada. These two small groups, however, are quite a distance apart.

Detached from these groups, Chemung, Chenango, Otsego, Suffolk, and Tioga, have one earthwork each, and Delaware three. Queens has two stockades, and there are historical notices of many stockades along the Hudson, of which no traces remain. Chenango County had one mound, and Franklin two. Columbia and some other counties had stone heaps accumulating within historic times. The remaining counties have sometimes points of archæological interest, but mainly in a minor way.

It must not be supposed that groups of works indicate always a number of contemporaneous villages, though this was sometimes the case. The Hurons, in Canada, had many towns; so had the Eries and Senecas in New York. The Onondagas, however, had generally one large and one small village at a time, and this was the case with the Oneidas. The Mohawks commenced with two, but soon had three or four. These were often removed, and a number of forts will often show the line of a nation's march.

As far as the interior of the State is concerned, early travel followed the valley of the St. Lawrence in the main, often at a considerable distance from the great lakes and river. The Mohawk valley was little frequented by early travellers. When they reached the west end of Oneida lake, coming eastward, they bore to the north, passing down the St. Lawrence, and sometimes into Lake Champlain. Better fishing and hunting may have caused this. For southern visitors, the Susquehanna afforded a convenient channel, and eventually the tide of Iroquois migration flowed southward through its valley, founding forts in many parts of the Keystone State. A thousand years ago, however, New York may have had few inhabitants, if any, west of the Hudson River Valley, but was a grand resort for fishermen and hunters.

W. M. BEAUCHAMP.

THE SUPPORT OF MUSEUMS.

THE utilitarian tendency of the American mind and habits of life undoubtedly often stand in the way of that broader culture and advancement, the absence of which in us calls for occasional sneers from our transatlantic cousins. "What is the good of it?" a query which demands an answer setting forth immediate returns that can be expressed in money values or equivalent gain, is too often on the lips of those best able to aid inquiry and research which, for the nonce, appears to have no direct bearing on the physical welfare of mankind.

These thoughts are occasioned by facts that have but recently come to the knowledge of the writer regarding the comparatively very limited means at the command of most of the leading museums of natural history in this country. A gentleman, interested in scientific research, well versed in certain departments, having looked the geographical field over, and coming to the conclusion that certain headwaters of the Amazons at present afford the most unknown and unexplored tropical territory now remaining on the globe, decided to give a year or more of his life to exploration in that field. Willing to cast his lot with the natives, to undergo all forms of deprivation familiar to such travellers, that his expenses might be reduced to a minimum, it seemed to him that there should be no difficulty in obtaining the amount of the bare cost of his journey and the transportation of the trophies and valuables he would be able to gather, from some museum in exchange for his entire collections. In his own case, such credit as he might win by scientific and other publications announcing the facts of his discoveries, was quite all that he cared to ask in return for months, perhaps years, of trial and hardship such as few can appreciate and still fewer are able to endure.

Yet, such is the present impecunious condition of the leading museums in our great cities, that after four months of effort in that direction the would-be explorer has been forced to confess his inability to make arrangements that would enable him to go out under these auspices; and the result must now be, what it has so frequently been before, that his material, with all its wealth of truths for the zoologist, botanist, ethnologist, and physicist, will go to London, Berlin, or Vienna. How much longer are Americans going to allow their self-denying scientific enthusiasts to be thus weaned, in deed if not in mind, from their natural desire to contribute to their home museums the results of their discoveries?

This evil does not cover only the field of foreign travel and research. When sums that many men now consider small to be set aside for an evening's reception or entertainment are not forthcoming in New York to purchase for her museum such treasures as the Grote collection of North

American Lepidoptera, which, with its untold wealth of type-specimens and uniques, went to the British Museum, or the Scott collection of the birds of Florida, the result of several years of patient toil on the part of a skilled ornithologist, which found its way into the same mighty storehouse, it can be imagined how quick European science is to profit by this display of parsimony in America.

To recur to the case of the Amazonian explorer, this present apathy can best be shown by quoting from a letter which has just been written to him by one of the gentlemen prominently connected with the American Museum of Natural History in Central Park. After stating that the authorities of the museum appreciate the "advantages to the museum" of the proposition made them, he adds that they "felt it would be impossible to meet its requirements;" yet these requirements were simply that a sum of but a few hundreds of dollars be raised for this purpose. After stating that "the trustees are already overburdened with the load of extra expenditures they have to meet from their own pockets to equip the new exhibition halls," the writer continues, "it would not be practicable for the present to co-operate with you in your very laudable enterprise. . . . Your case, however, is only one out of a score or more of a somewhat similar character which have ended in a similar way — greatly to the disadvantage of our museum."

This is a dark picture, coming as it does from the nation's centre of wealth and business energy, but it is, unfortunately, only a sample of what is of almost monthly occurrence in one or the other of our larger cities. The occasional exception to this, which has made possible the infrequent dispatching of small expeditions, but emphasizes the general rule. Our museums are carried on, made possible, in fact, by the self-denial and enthusiasm of men who, after spending years in attaining a degree of special knowledge fitting them for their scientific positions, are yet willing to accept salaries that would be spurned by book-keepers and country parsons, that they may continue in touch with their chosen walk in life. The idea so prevalent among successful business men that such specialists are as a rule visionaries who are, by the very nature of their long scientific training, unfitted for any other life, is found on the most cursory examination of the facts to be erroneous. The researches of Henry in electricity, of Langley in aerodynamics, of Goode in ichthyology, or Riley in entomology, to take examples from one museum, are none the less practical and of incalculable value to the public, given free to the world as they are, than they would be if they had been protected by ample patents and had yielded their discoverers great financial returns in place of the plaudits of their fellows, best able to appreciate their work, with the which they have been willing to rest content.

It is time that more of our moneyed men were brought to regard this subject in a different light. The country naturally, and with right, looks to New York to set the example in this direction of larger aid for public museums of natural science.

Eugene Murray Aaron.

ASTRONOMICAL NOTES.

Mr. Berberich of Berlin has recently called attention, in a letter to the editor of the *Astronomical Journal*, to some interesting facts connected with the periodic comet discovered by Wolf in 1884. He gives an approximate ephemeris for the return of the comet in 1898, as it will not be greatly perturbed in the interval. From these data it appears that the comet will be favorably placed for observation during its next return. In following returns the comet will not be so favorably placed for observation. As seven revolutions of the comet are nearly equal to three of Jupiter, a second approach of the two bodies will occur in 1922–23, which will probably deprive us of a view of this comet for a long time, and perhaps forever.

Again the telegraph flashes the announcement of the death of another eminent English astronomer and mathematician, Professor J. C. Adams. To Professor Adams is due the grandest work ever performed for astronomy by the human mind — the discovery by mathematical reasoning of our outermost planet, Neptune. At another time we hope to be able to give the readers of *Science* a sketch of his life.

The Sidereal Messenger, which has for the past ten years been published by Professor W. W. Payne, at Northfield, Minn., has been greatly increased in size, and in the future will contain not only subjects in general astronomy, but will take up the subject of astrophysics. In the January number of the magazine will be found the photographs of prominences upon the sun, obtained by Mr. Hale of Chicago. That gentleman will have charge of the astrophysical department of the magazine.

In No. 253 of the *Astronomical Journal* Professor A. Hall gives the result of his discussion of the observations made of Iapetus, the outer satellite of Saturn, made with the large equatorial at the Naval Observatory. The resulting elements for Iapetus give for the mass of Saturn

$$M = \frac{1}{3485.7 \pm 1.28}.$$

The following is a continuation of the ephemeris of Winnecke's comet, which is now due. The epoch is for Berlin midnight: —

	R.A.			Dec.	
	h.	m.	s.	°	′
Feb. 6	12	47	23	+ 17	0
7		47	55	17	13
8		48	26	17	26
9		48	55	17	39
10		49	23	17	52
11		49	49	18	6
12		50	14	18	21
13		50	37	18	36
14		50	39	18	51
15		51	19	19	6
16		51	38	19	22
17	12	51	55	+ 19	39

G. A. H

HAINAN.[1]

The great island of Hainan, off the south-eastern coast of China, is but little known to Europeans, although since 1877 there has been a treaty port there. Mr. Parker, the Consul at Kiungchow, the port in question, lately made a short journey in the interior of the island, of which he gives some account in a recent report. He travelled about sixty miles up the Poh-Chung River, to within a mile or two of Pah-hi, which is, at most seasons of the year, considered the limit of navigation for all but the smallest craft. He walked round the walls of Ting-an city, one of the disturbed districts during the recent rebellions, on New Year's Day (Feb. 9); they are just one mile in circuit, and differ little from those of other

[1] From Nature.

Chinese cities. Wherever he had an opportunity of walking diametrically across lengthy curves of the river he found the inclosed area to be extremely well cultivated; though not so flat, its general appearance recalled many features of the Tonquin delta, especially in its great wealth of Bamboos. The productions of the soil are much the same, the papaw, areca-palm, sweet potato, turnip, ground-nut, orange-tree, etc.; but a peculiar Hainan feature is the cocoa-nut palm. Another peculiarity of this region is the ubiquitousness of the dwarf *Pandanus*, probably the same as the *P. odoratissima* of Fiji, the fibre of which is used in the manufacture of grass-cloth, and is usually known to foreign trade here as hemp. Much of the land was under sweet potato cultivation, and every household seemed to possess a few pigs, of the very superior and stereotyped Hainan variety, black as to the upper and white as to the lower part of the body, with a dividing line of gray running along the side from the snout to the tail. These wholesome-looking pigs are fattened on the sweet potato, and do not rely for sustenance upon precarious scavengering, as is the case with the repulsive and uncleanly animals of North China. Land contiguous to the river is irrigated by enormous wheels, forty feet in diameter, of very ingenious construction, moved by the current, needing no attention, and discharging perhaps one hundred gallons of water in a minute into the trough above, day and night without intermission. He passed several large pottery establishments; but, as at the New Year all business and cultivation are suspended for a few days, the opportunity was not a very good one for gathering precise information. The temperature during the week ranged between 50° and 69° F. Game seemed plentiful everywhere, and he mentions that a German resident has recently made a very fine collection of about 400 Hainan birds, embracing 154 species, which will shortly be on their way to a Berlin museum. One of the commonest birds in the river is a spotted white and black kingfisher of large size. Amongst the trees which attracted his attention was one locally called the "great-leaved banyan," which looks remarkably like the gutta-percha tree: the natives seem to use its gum mixed with gambier, in order to make that dye "fast;" but there is some doubt whether it is not the sap of the real banyan-tree which is used for the purpose. A very strong silk is made from the grub called the "celestial silk-worm," or, locally, "paddy-insect." This grub is found on a sort of maple. When full-grown it is thrown into boiling vinegar, on which the "head" of the gut, or "silk," appears; this is sharply torn out with both hands, drawn apart, and is as long as the space between them, say five feet; it is so strong that one single thread of it is sufficient to make a line with which to catch the smaller kinds of fish.

SERICULTURE IN ASIA MINOR.[1]

IN May, 1885, the writer was enabled, from personal observation on the spot, to report upon the silk harvest of Bournabat, near Smyrna, Asia Minor, which report was printed in the *Journal* (Vol. XXXIII. p. 852). The sericultural industry was then in a state of slow revival from a condition of almost utter collapse, caused by the deadly effects of the various silkworm diseases which had long devastated, and nearly ruined, the "magnaneries" of France and Italy. Subsequently, in 1887, in an extended and illustrated form, the report was reproduced, with additional sericultural and other information, in the volume entitled "Pen and Pencil in Asia Minor," published by Sampson Low & Co. On both these occasions the writer endeavored to interest the public in the story of an effort, on the part of an English gentleman, to benefit the Turkish peasantry and revenue of the country, which had more of the romantic element in it than is usually to be found in ordinary industrial operations. For nearly half a century Mr. John Griffitt of Bournabat, a village near Smyrna, has devoted most of his leisure hours, well seconded by his accomplished Greek wife, to combatting the maladies of silkworms, experimenting with the various known races, and endeavoring to improve the quantity and quality of their silken produce. Long before M. Pasteur, the distinguished French physiologist, took the field, Mr. Griffitt had been working at the same problems, the solution of which brought the great Frenchman afterwards so much well-deserved honor; but while the one was rewarded the other has hitherto been neglected. The first enjoyed the wealth and influence of his Government to encourage him in all his efforts; the second has had to struggle on unaided throughout his long career of philanthropic endeavor against the inertia of sluggish or hostile officials, the childishness of a prejudiced peasantry, and a horde of unscrupulous native and foreign parasites, ever ready to appropriate his methods without acknowledgment, to claim or dispute his discoveries, and to defraud him in every possible way. From the first, Mr. Griffitt welcomed and applauded the remarkable results of M. Pasteur's investigations, and became his acknowledged disciple; but, being himself a practical silk-farmer, which M. Pasteur was not, was soon in a position to shoot ahead of his master, to modify, supplement, and stamp with his own genius many of the suggestions of the great chemist, for which he never received either credit or reward. Probably in no other country in the world except Turkey could a native, or even a foreigner, accomplishing the revival of a staple industry, as Mr. Griffitt has done, have escaped recognition, or being loaded with honors. He has rescued sericulture, upon which so many thousands, perhaps millions, depend in Turkey, from extinction, and been a means of replenishing the usually collapsed Ottoman exchequer, and enabling the Porte to offer British bond-holders — if it chooses to do so — substantial dividends instead of polite excuses.

Still more recently the writer had a paper in the *Journal* of Aug. 28, 1889 (Vol. XXXVII. p. 772), when further information was given regarding Mr. Griffitt's continued successes, particularly in open-air sericulture. On the present occasion he would add the latest facts, which are quite as interesting as those already communicated.

At the beginning of 1891 a report by the "Chambre des Deputés" was presented to the French Government, in which it was said that sericulture was not progressing in France in consequence of the reappearance of the dreaded disease known as "flacherie," along with some minor maladies, and that the nurseries were being decimated. M. Pasteur's discoveries had enabled the silk-farmers to vanquish the other distemper, "pebrine," but "flacherie" was working havoc everywhere, so a grant of several millions of francs was asked to be expended in trying to crush the disorder.

Meanwhile, Mr. John Griffitt, with no Government money or help of any kind, had thoughtfully built up a system of scientific silk farming at Bournabat, near Smyrna, in which he combined the most notable of M. Pasteur's discoveries with the invigorating method of M. Roland of Switzerland, and his own experiences, with the result that his worms acquired such robustness that he had had no deaths among

[1] From the Journal of the Society of Arts.

them for years, while all the races subjected to the process yielded a larger crop of better silk than before. So marked was this improvement that a comparison will show it at a glance. In the first report, already alluded to, made in 1885, Mr. Grifflitt's yield of cocoons — considered a splendid return at the time — was 76 kilogrammes (171 pounds avoirdupois) per ounce of eggs set to hatch, while in 1890 the harvest was 91 kilogrammes (200 pounds) per ounce of eggs. These figures have been vouched for by M. E. Charmand, chief of the Smyrna branch of the "Direction Générale de l'Administration de la Dette Publique Ottomane, à Constantinople," who reported his observations, gathered from time to time in Mr. Grifflitt's factory at Bournabat, to his superiors at the Turkish capital.

Following up these efforts, and stimulated by the ill-success of the French sericulturists, Mr. Grifflitt last year achieved an additional triumph, his latest crop showing an advance to 92 kilogrammes (202 pounds) of cocoons per ounce of eggs. This harvest had likewise been watched through all its stages, and reported upon to the Constantinople authorities by the same gentleman already named, who added that as the yield from foreign eggs had been *nil* at Bournabat, their importation into Turkey ought to be stopped.

It will be evident to the readers of the above and former communications that Mr. John Grifflitt's single-handed and almost phenomenal success in sericulture, in the face of the utter failure of the best silk-farmers of France, point to Bournabat as the future sericultural school of the world, and as the *entrepot* for robust graine. If further figures be required, they are to be found in the circumstance that during the last four or five years the finest French eggs hatched at Bournabat have only yielded from 10 to 12 kilogrammes (22 to 26 pounds) of cocoons per ounce, as compared with Mr. Grifflitt's 92 kilogrammes (202 pounds) per ounce of eggs; while last season, according to M. Charmand, the French eggs laid out at Bournabat did not hatch at all.

WILLIAM COCHRAN.

Overdale, Dunblane, Perthshire.

MR. KOEBELE'S SECOND TRIP TO AUSTRALIA.[1]

We have not yet mentioned in these pages the fact that Mr. Koebele has been sent out to Australia and New Zealand a second time on a search for beneficial insects. The California State Legislature last winter appropriated $5,000 for sending some one to Australia for this purpose, and this sum was placed at the disposal of the State Board of Horticulture. The board soon afterward made application to the Secretary of Agriculture to have Mr. Koebele sent, placing the entire appropriation at the secretary's disposal. To this proposition the secretary assented on condition that Mr. Koebele should go under instructions from the department, his salary as an agent of the division of entomology being continued (his expenses only to be paid by the State Board of Horticulture), and that his report should be made to the Department of Agriculture, the desire being to co-operate as far as possible with the board. Accordingly, such instructions were given as seemed best to promote the object in view, cautioning Mr. Koebele particularly to run no risk, in his sendings from Australia, of importing with the beneficial insects any injurious species not now existing in the United States which it might prove disastrous to introduce, and taking advantage of the occasion also to have him make every effort to collect in California certain beneficial species to take with him to Australasia, indicating such species as prey upon cosmopolitan insects or species which the colonies mentioned have derived from America.

Mr. Koebele sailed on the August steamer, stopping at Honolulu and Auckland, and arriving at Sydney the latter part of October. At Honolulu he left a number of living specimens of *Chilocorus bivulnerus* in the hands of our correspondent, Mr. A. Jaeger, and secured while there four species of lady-birds, of which he sent small numbers to California by steamer. These were sent for use against the black scale (*Lecanium oleæ*). He also found a few parasitic Chalcididæ on an undetermined Lecanium, and of these he also sent a few specimens. Upon his arrival in New Zealand some of the lady-birds which he had taken with him were alive and began to feed at once upon woolly aphis. Some syrphus flies and lace-wing flies were also in good condition, as were also the larvæ of the Rhaphidia, which feeds upon the codling moth. These were left in competent charge. Specimens of *Scymnus acceptus*, *S. consor*, *S. villosus*, *S. flavihirtus*, and *S. fagus* were collected and sent to California. These all prey upon various species of scale insects, but it is hardly to be supposed that they will accomplish any better results in California than do our native species of this genus, all of which have a similar habit.

The most encouraging information comes to us under date of Nov. 1 from Sydney. He there finds that *Orcus chalybeus*, a steel blue lady-bird, is a most important enemy of the red scale. He has found them by the hundreds, and has observed the mature insects eating the scales. All of the trees were "full of eggs," and the larvæ were swarming upon all the orange and lemon trees infested with the red scale. He secured and sent a large lot of the eggs and many of the adult beetles. He also sent the allied *Orcus australasiæ*, also found feeding upon the red scale, and a number of scymnids, one of which was very numerous, feeding upon the same scale-insect. Another species was found feeding mainly upon the flat scale (*Lecanium hesperidum*) and the black scale (*Lecanium oleæ*). He also forwarded a number of *Leis conformis*, which, as stated in Bulletin No. 21 of this division, is the commonest enemy of the woolly root-louse of the apple. Unfortunately Mr. Koebele does not state whether the three insects mentioned as feeding upon the red scale were successful in holding that destructive insect in check, and upon this point naturally depends much of their value to California. Our agent at Los Angeles, Mr. D. W. Coquillett, has been instructed to spare no pains to properly care for and colonize whatever may be received from Mr. Koebele, and is fully prepared to do so. This large sending arrived at Los Angeles, we are sorry to state, in rather bad condition. Twenty-eight beetles, however, were alive, including nine of *O. chalybeus*, and no effort will be spared to keep them in good condition and to induce them to propagate.

[1] From Insect Life for December, issued by the U. S. Division of Entomology.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The First Locomotive.

I AM surprised that your correspondent, "M. H.," in his article in your issue of the 15th, "The First Locomotive Run in America," should have been so mistaken in its name. There is a small

town in England which at one time had a great reputation for locomotive building. It is Stourbridge. The locomotive which M. H. correctly states was operated at Honesdale over a half-century ago, was made there. From this fact it was called the Stourbridge Lion, not "Stonebride," as your correspondent has it. This name and the reason for it are very familiar in Scranton, whence I write, but as a clincher, I may say that I recently conversed on the subject with a lady who enjoyed the acquaintance of Mr. Allen, the engineer of the locomotive in question, and from her I once more learned the facts here narrated.

STANLEY M. WARD.

Scranton, Pa., Jan. 26.

A Section of Botany in the American Association.[1]

THE thought of having a section for the botanists in the American Association should be very inspiring to all who have at heart the thorough study of plant life in America. All admit that Section F is now crowded with members and papers, and doubtless many are deterred from taking part in the sessions from lack of opportunity. At the last meeting numerous papers were passed without comment or discussion that the programme might be carried out.

The work of the section has naturally divided itself into two groups, namely, that pertaining to animal life, and to botany. In order to gain more time and draw together more closely those who are interested in particular branches, clubs have been formed. Thus the entomological and botanical clubs have arisen and grown into features of the week of as much importance as the section and more perhaps to the younger members. These clubs should, and doubtless will, be continued. In the section itself for years there has been an attempt on the part of the programme committee to group the subjects so that zoologists and entomologists have had a half-day assigned them, alternately with the botanists. This has virtually broken up the continuous attendance of members upon the sectional meetings, and excursions or other events are indulged in by the party not upon the programme. Perhaps to our shame, this has been particularly true of the botanists, who have sometimes left the zoologists with a depleted but more homogeneous and attentive audience. Also within the past few years the plan of having time assigned for a series of connected papers upon one or more of the branches of science coming under the present scope of the section has still further differentiated the work. As Section F now stands its sessions are largely an alternation of groups of subjects with an audience that shifts with the programme.

A notice of an amendment to divide Section F is therefore well founded; the division is very natural and one that, in fact, has already been made, so far as arranging the programme by grouping the subjects and by the work of the clubs will permit it. In short, it has gone as far as it can save by a division of the section itself.

The contemplated division will bring many gains without corresponding losses. Time will then be offered for thorough sectional work upon the two large and growing fields of biological science, instead of the rapid reading of papers, as at present, followed by little or no discussion before a half-interested audience.

With a Section of Botany, for example, officers can be selected who will be interested in all subjects presented, a condition that does not always obtain under the present arrangement, to say nothing about the difficulty that may now arise as to the proper apportionment of the official plums among the aspirants for honors.

If we believe in the principle of division of labor and specialization, in short, in the theory of evolution in its broad and best sense, we cannot but feel that the proposed step is in the direction of advance, and realize that the last few meetings of Section F indicate clearly that the time to take the step forward is at hand.

The best way to make the importance of a division still more emphatic is for every student of the biological sciences to come, if possible, to the Rochester meeting with a large number of full papers, and strive to have as many as possible read and discussed in Section F, the balance of shorter ones to be considered as best they may at the clubs. As a section of botany is asked for, let the botanists in particular show, by their works, their faith in the reasonableness of the demand.

BYRON D. HALSTED.

Rutgers College, Jan 25.

[1] This letter also appeared in the Botanical Gazette.

AMONG THE PUBLISHERS.

THE Regent Street Polytechnic Institute of London proposes to bring over a thousand or more of its young clerks, mechanics, and apprentices to visit the Chicago Exposition; and its secretary, Mr. Robert Mitchell, is about to arrive at New York on his way to Chicago, for the purpose of making transportation and other advance arrangements. Steamship arrangements have already been made. Mr. Albert Shaw, American editor of the *Review of Reviews*, describes in an illustrated article in the February number "The Polytechnic and its Chicago Excursion."

— In the February number of *Babyhood* Dr. William H. Flint discusses the dislikes of children to certain articles of food and the means of overcoming such antipathies. Of equal value to mothers is an article on "Colic," by Dr. C. L. Dodge, in which the causes, symptoms, and treatment of that common ailment are clearly described. "Ought Obedience to be Enforced?" "The Tyranny of Whims," "Talking about Children in their Hearing," etc., are some of the other topics discussed. The medical editor furnishes advice concerning such "Nursery Problems" as the voracious appetite often seen in children, the desirableness of giving fruit to infants, the treatment of eczema, etc.

— Claus Spreckels, the millionaire sugar manufacturer, whose plantations are in the Sandwich Islands, has written to Mrs. Helen Mather that he has carefully read her book, "One Summer in Hawaii" (Cassell Publishing Company), and that he "commends it to the earnest attention and study of all such as are desirous of obtaining a knowledge of the beauties of that comparatively unknown and still less appreciated Paradise of the Pacific."

— The Cassell Publishing Company will publish in February "Across Thibet," by Gabriel Bonvalot, author of "Through the Heart of Asia," with upward of one hundred illustrations, made principally from photographs taken by Prince Henry of Orleans. Of this book the London *Times* says: "M. Gabriel Bonvalot has already achieved a high reputation as a central Asian explorer. 'Across Thibet' is thus recommended alike by the character and literary skill of the explorer and by the interest and novelty of the regions explored by him. The journey here described was undertaken in the company of Prince Henry of Orleans, son of the Duke de Chartres, and of Father Dedeken, a Belgian missionary, with a rare taste and aptitude for adventurous travel and a keen appetite for sport, and it tried to the utmost the endurance and the enterprise of all three. The copious illustrations due to Prince Henry's camera are full of interest and the translation is excellently done."

— There has just appeared in the "Johns Hopkins University Studies in Historical and Political Science" a pamphlet by Paul E. Lauer on "Church and State in New England." Beginning with the Reformation in England, the author traces the movement of thought on the relations of church and state, first among the Puritans of England and then among their descendants in the New World; and shows how the new ideas of religious freedom expressed themselves in political action, ending with the complete secularization of the state in the present century. The main principles involved and the mode of their application are well shown, and the narrative, though destitute of imaginative insight, is straightforward and clear. Unfortunately for Mr. Lauer, however, it is all a threshing of old straw. The story he relates has been told so often and so well that this pamphlet is more likely to weary than to interest the reader. Moreover, it is impossible to treat satisfactorily of the relations of church and state in any nation apart from the general religious and political history of the time, so that Mr. Lauer's work is incomplete and fragmentary.

Regarded as a college exercise it deserves cordial praise; but as a contribution to historical literature it cannot be said to have much value.

— In the second of *The Century's* articles on "The Jews in New York," in the February number, social customs, weddings, schools, etc., are treated, and the illustrations include several views of the new Temple Beth-El, the interior of the Progress Club, etc.

— A recent number of "The World's Great Explorers" series (Dodd) is Captain Albert Hastings Markham's "Life of Sir John Franklin." The story of the life of such a man, a skilful sailor, an ardent explorer, an able administrator, and a daring and successful Arctic navigator to whom the world owes, directly and indirectly, its knowledge of a very large portion of the Arctic basin, should not remain untold, especially in view of the meagreness of hitherto published authentic material. The closing chapters, treating of the various expeditions despatched in search of Franklin, contain valuable suggestion and comment as to the conduct of navigators exploring high latitudes. The volume is provided with the maps and charts requisite to intelligent reading, as well as with several illustrations.

— The late Henry Edwards, the actor, wrote more than 150 books, pamphlets and articles, chiefly on topics of Natural History, and all these were published at various times and in various places. Mr. William Bentenmüller, of the American Museum of Natural History, has contributed to *The Canadian Entomologist* (London, December, 1891, Vol. 23, No. 12) a complete list of these writings. It fills more than eight pages, and it is strikingly suggestive of the ample learning and devoted labor of the author, whose place among men of science was even more distinguished than his rank upon the stage.

— In the February *Atlantic*, Professor Rodolfo Lanciani, author of "Ancient Rome in the Light of Recent Discoveries," contributes a paper on "The Pageant at Rome in the Year 17 B.C.," giving the details of some inscriptions very recently discovered commemorating the celebration of secular games under Augustus, for which Horace wrote his famous "Carmen Seculare."

— A new danger threatens English publishers. In future they will have to be careful that the titles of the works they publish correspond with the contents, otherwise they will lay themselves open to a prosecution for obtaining money under false pretences. Such is the lesson taught by a recent decision of Sir Frederick Darley, the Chief-Justice of New South Wales. A Sydney firm issued a work in two volumes entitled "Australian Men of Mark." A subscriber refused to pay, on the ground that his biography was not included in the work, as was promised. The publishers sued him; the Chief-Justice went through the book and declared that no action could lie, inasmuch as the book was not what it professed to be. The people whose biographies it contained had a mere local celebrity in the towns where they resided. They were

CALENDAR OF SOCIETIES.

Philosophical Society, Washington.

Jan. 30.—Joseph LeConte, The Relation of Philosophy to Psychology and to Physiology.

Society of Natural History, Boston.

Feb. 3.—J. Eliot Wolff, the Geology of the Crazy Mountains, Montana; Walter G. Chase, The Scenery, Glaciers, and Indians of Alaska.

Appalachian Mountain Club, Boston.

Feb. 8.—Arthur L. Goodrich, The Waterville Valley; Roswell B. Lawrence, Middlesex Fells; Charles E. Fay, An Excursion Over the Whiteface Tripyramid Ridge.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the 'Want' inserted under this head FREE OF COST, *if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.*

WANTED.—Books on the Magic Lantern. Will exchange, "How the Farm Pays," by Coster and Henderson; "Culture of Farm Crops," by Stewart; "American Agriculturist," 1890 and 1891. I. SLEE ATKINSON, 43 Wallace St., Orange, N. J.

WANTED.—(1) A white man versed in wood and iron working, able to work from specifications and plans, suited for an instructor of boys; his business to have charge of shops of school, outline and direct the work for foremen and students; salary to be $1,000 per annum (nine months). (2) A man (black preferred) to teach the colored, iron working and forging, subordinate to the preceding; salary, $720. (3) A man (white) competent to take classes in engineering (assistant's position), but with the ability to perform any of the work required in any of the ordinary engineering courses of our universities; salary from $1,000 to $1,500. A. H. BEALS, Milledgeville, Ga.

WANTED.—Two or three efficient computers with good knowledge of Spherical Trigonometry and ready use of logarithms, for temporary employment in the office of the Coast and Geodetic Survey. Applicants should furnish evidence of their fitness for the work. Apply by letter to the Superintendent, Coast and Geodetic Survey, Washington, D.C.

WANTED.—*Science*, No. 178, July 2, 1886, also Index and Title-page to Vol. VII. Address N. D. C. Hodges, 874 Broadway, New York.

WANTED.—A position in the philosophical or pedagogical department of a college or university by a young man (30) who has had five years' practical experience in teaching, and who has done four years' post-graduate work in philosophy, devoting his attention during the last two years especially to study and original investigation in scientific psychology and its applications in education. Address E. A., care *Science*, 874 Broadway, N. Y. City.

WANTED.—A suitable position in Washington, D. C., not connected with the Government, and with a salary not to exceed $600 a year, by an experienced biologist with six years' university training. Applicant has been a skilful surgeon for fourteen years; is a practical photographer, cartographer, and accustomed to the use of the typewriter. He is also capable of making the most finished drawings, of any description, for all manner of illustrative purposes in science; trained in museum methods and work; also field operations and taxidermy in its various departments, and modelling, production of casts, restorations of palæontological specimens and similar employments. Address U. S. B., care *Science*, 874 Broadway, New York.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England;" Samuels' "Our Northern and Eastern Birds;" all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

Wanted to buy or exchange a copy of Holbrook's North American Herpetology, by John Edwards. 5 vols. Philadelphia, 1842. G. BAUR, Clark University, Worcester, Mass.

For sale or exchange, LeConte, "Geology;" Quain, "Anatomy," 2 vols.; Foster, "Physiology," Eng. edition; Shepard, Appleton, Elliott, and Stern, "Chemistry;" Jordan, "Manual of Vertebrates;" "International Scientists' Directory;" Vol. I. *Journal of Morphology;* Balfour, "Embryology," 2 vols.; Leidy, "Rhizopodes" *Science*, 12 vols., unbound. C. T. McCLINTOCK, Lexington, Ky.

For sale.—A 6½ x 8½ Camera; a very fine instrument; with lens, holders and tripod, all new; it cost over $40, price, $25. Edw. L. Hayes, 6 Athens street, Cambridge, Mass.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g to 1-100g), platinum dishes and crucibles, agate motors, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1860-1885 (62-71 bound); Smithsonian Reports, 1854-1883; U. S. Coast Survey, 1844-1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

For exchange or sale at a sacrifice, an elaborate microscope outfit. Bullock stand; monocular objectives, one-sixth homogeneous immersion, four-tenths, and three inch, Bausch & Lomb, also one-fourth and one inch Spencer. Four eye-pieces. Objectives are the best made. Address Mrs. Marion Smith, 41 Branch Street, Lowell, Mass.

not sufficiently widely known to be called "Australian Men of Mark," and so the Chief-Justice decided against the enterprising publishers. Furthermore, the Chief-Justice ruled that all contracts entered into on account of the book, and not yet carried out, were null and void.

— Manganine is the name of a new alloy, consisting of copper, nickel, and manganese, which has been brought on the market, says the *Engineering and Mining Journal*, by the German firm, Ahlar, Haas, & Angerstein, as a material of great resisting power. The specific resistance of manganine is given as forty-two microhm centimetres; that is, higher than that of nickeline, which has hitherto passed as the best resisting metal. Another advantage of manganine is its behavior under variations of heat, the resistance, it is claimed, being affected only in a minute degree by high temperatures. It is therefore adapted for the manufacture of measuring instruments and electrical apparatus in general, which are required to vary their resistance as little as possible under different degrees of heat. A further interesting fact is that while other metals increase their resistance by the raising of the temperature, that of manganine is diminished.

— M. de Quatrefages, the well-known anthropologist, died on Tuesday, January 12. He was born, says *Nature*, in 1810, and studied medicine at Strasburg. Afterwards he became professor of zoology at Toulouse, where he had settled as a medical practitioner. In 1855 he was made professor of anthropology and ethnology at the Jardin de Plantes, Paris. He had already been admitted to the Academy of Sciences in 1853, and he was an honorary member of many foreign learned societies. Numerous friends and pupils were present at the funeral, and addresses were delivered by M. Milne-Edwards, and other men of science. The most famous of his writings are his "Crania Ethnica" and "Études des Races Humaines."